

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently Amended) A bone fixation apparatus comprising:
 - a bone fixation plate having a fixation hole; and
 - a modular bone fixation fastener received in the fixation hole, the bone fixation fastener including a shaft member and an expandable annular head member defining an internal surface, the shaft member having an defining a circumferential outer cam at a first end, the outer cam defined by in the form of a continuous curve of continuous slope and variable radius, the internal surface of the head member having a defining a circumferential inner cam defined by in the form of a continuous curve of continuous slope and variable radius and devoid of kinks, the outer cam circumferentially mating with the inner cam of the head member, such that upon rotation of the head member relative to the shaft member, the head member radially expands to prevent back out of the shaft member relative to the bone fixation plate.
2. (Original) The bone fixation apparatus of Claim 1, wherein the outer cam and the inner cam each have at least one lobe.
3. (Original) The bone fixation apparatus of Claim 1, wherein the outer cam and the inner cam each have a plurality of lobes.

4. (Original) The bone fixation apparatus of Claim 1, wherein the fixation hole includes a countersunk portion receiving at least a portion of the expandable head member of the bone fixation fastener.

5. (Original) The bone fixation apparatus of Claim 1, wherein each of the outer and inner cams includes three equidistant lobes.

6. (Original) The bone fixation apparatus of Claim 1, wherein the inner surface of the fixation hole is spherical and engages a spherical outer surface of the head member, such that the fixation fastener can be positioned at a plurality of angles relative to the plate before locking.

7. (Original) The bone fixation apparatus of Claim 1, wherein the bone fixation plate includes a viewing window.

8. (Original) The bone fixation apparatus of Claim 1, wherein the bone fixation plate is a spinal fixation plate for securing first and second vertebral bodies relative to one another.

9. (Original) The bone fixation apparatus of Claim 1, wherein the bone fixation plate is a spinal fixation plate for securing at least three vertebral bodies relative to one another.

10. (Original) The bone fixation apparatus of Claim 1, further comprising at least one viewing window.

11. (Original) The bone fixation apparatus of Claim 1, further comprising at least one aperture receiving an anchoring fastener.

12. (Original) The bone fixation apparatus of Claim 1, further comprising at least another fixation hole receiving another modular fixation fastener.

13. (Original) The bone fixation apparatus of Claim 1, in combination with an insertion and removal tool, the tool comprising a first driver attached to a handle, the driver adapted to engage the head member for rotation of the head member relative to the shaft member.

14. (Original) The bone fixation apparatus of Claim 13, wherein the tool comprises a second driver adapted to engage the shaft member for inserting and removing the shaft member to and from a bone portion when the fixation member is not locked.

15. (Original) The bone fixation apparatus of Claim 1, wherein the head member radially expands against an inner surface of the fixation hole to pressure-lock the fixation fastener and thereby prevent relative movement between the fixation fastener and the plate.

16. (Previously Presented) The bone fixation apparatus of Claim 1, wherein the head member and the fixation fastener are cooperatively configured to provide a first mode of operation in which the head member is prevented from backing out relative to the plate and the fixation fastener is adjustable relative to the plate and a second mode of operation in which the head member is prevented from backing out relative to the plate and the fixation fastener is arrested relative to the plate.

17. (Currently Amended) A bone fixation apparatus comprising:

 a bone fixation plate having a fixation hole; and

 a modular bone fixation fastener received in the fixation hole, the bone fixation fastener comprising:

 a shaft member having a head-receiving first end, the first end including defining a circumferential multi-radius continuously curved outer surface, the outer surface having continuous slope and defining a shaft cam lobe; and

 an expandable head member having an inner opening defining an internal circumferential surface in the form of having a multi-radius continuously curved inner surface, the inner surface having continuous slope and being devoid of kinks and defining a head cam lobe circumferentially mating with the shaft cam lobe, such that upon rotation of the head member relative to the shaft member, the shaft cam lobe rotates out of alignment relative to the head cam lobe forcing the head member to expand radially to prevent back out of the shaft member relative to the bone fixation plate.

18. (Previously Presented) The bone fixation apparatus of claim 17, wherein the head member radially expands against an inner surface of the fixation hole to pressure-lock the fixation fastener and thereby prevent relative movement between the fixation fastener and the plate.

19. (Original) The bone fixation apparatus of claim 17, wherein the inner head surface and the outer shaft surface each define a plurality of mating cam lobes.

20. (Original) The bone fixation apparatus of claim 19, wherein the inner surface of the fixation hole is spherical and engages a spherical outer surface of the head member, such that the fixation fastener can be positioned at a plurality of angles relative to the fixation plate when the head member is not expanded.

21. (Original) The bone fixation apparatus of claim 17, wherein the head member and the fixation fastener are cooperatively configured to provide a first mode of operation in which the head member is prevented from backing out relative to the plate and the fixation fastener is adjustable relative to the plate and a second mode of operation in which the head member is prevented from backing out of relative to the plate and the fixation fastener is arrested relative to the plate.

22-36. (Canceled)

37. (Currently Amended) A bone fixation apparatus comprising:
a bone fixation plate having a fixation hole, the fixation hole having a first diameter in a plane generally parallel to an upper surface of the bone fixation plate; and
a modular bone fixation fastener received in the fixation hole, the bone fixation fastener including a shaft member defining a shaft axis and an expandable annular head member carried by the shaft member, the expandable head member being rotatable about the shaft axis relative to the shaft member between a first position and a second position, such that in the first position the expandable head member has a maximum diameter that is smaller than the first diameter of the fixation hole, and in the second position the expandable head member has a maximum diameter that is greater than the first diameter.

38. (Original) The bone fixation apparatus of claim 37, wherein the expandable head member has a generally spherical outer surface.

39. (Original) The bone fixation apparatus of claim 38, wherein the fixation hole is generally spherical.

40. (Currently Amended) The bone fixation apparatus of claim 37, wherein the shaft member has a circumferential outer shaft cam mating with a corresponding circumferential internal head cam of the head member, such that in the first position the head and shaft cams are aligned and in the second position the head and shaft cams are misaligned, and wherein the each of the head and shaft cams is defined by a continuous curve of variable radius and continuous slope.

41. (Previously Presented) The bone fixation apparatus of claim 37, wherein in the second position the fastener is pressure locked against the fixation hole and thereby prevents relative movement between the fixation fastener and the plate.

42-44. (Canceled)